

the squeezing apparatus 950 can include a pair of plates 952, 954 disposed on opposing sides 942, 943 of the recessed central portion 914. The plates 952, 954 are movable relative to each other by a suitable actuator 960. The actuator 960 can be operated either automatically or selectively to move the plates 952, 954 together relative to each other to apply a compressive force upon the splitter 900 at the recessed central portion 914 and the junction 920.

When the squeezing apparatus 950 squeezes the flow splitter, the squeezing action applies compressive force to the flow splitter 900, which flexes inwardly in response. This compressive force can help prevent buildup of solids inside the splitter 900 which may disrupt the substantially equally split flow to the slurry distribution through the outlets 904, 906. In some embodiments, the squeezing apparatus 950 is designed to automatically pulse through the use of a programmable controller operably arranged with the actuators. The time duration of the application of the compressive force by the squeezing apparatus 950 and/or the interval between pulses can be adjusted. Furthermore, the stroke length that the plates 952, 954 travel with respect to each other in a compressive direction can be adjusted.

Embodiments of a slurry distributor, a gypsum slurry mixing and dispensing assembly, and methods of using the same are provided herein which can provide many enhanced process features helpful in manufacturing gypsum wallboard in a commercial setting. A slurry distributor constructed in accordance with principles of the present disclosure can facilitate the spreading of aqueous calcined gypsum slurry upon a moving web of cover sheet material as it advances past a mixer at the wet end of the manufacturing line toward a forming station.

A gypsum slurry mixing and dispensing assembly constructed in accordance with principles of the present disclosure can split a flow of aqueous calcined gypsum slurry from a mixer into two separate flows of aqueous calcined gypsum slurry which can be recombined downstream in a slurry distributor constructed in accordance with principles of the present disclosure to provide a desired spreading pattern. The design of the dual inlet configuration and the distribution outlet can allow for wider spreading of more viscous slurry in the cross-machine direction over the moving web of cover sheet material. The slurry distributor can be adapted such that the two separate flows of aqueous calcined gypsum slurry enter a slurry distributor along feed inlet directions which include a cross-machine direction component, are re-directed inside the slurry distributor such that the two flows of slurry are moving in substantially a machine direction, and are recombined in the distributor in a way to enhance the cross-direction uniformity of the combined flows of aqueous calcined gypsum slurry being discharged from the distribution outlet of the slurry distributor to help reduce mass flow variation over time along the transverse axis or cross machine direction. Introducing the first and second flows of aqueous calcined gypsum slurry in first and second feed directions that include a cross-machine directional component can help the re-combined flows of slurry discharge from the slurry distributor with a reduced momentum and/or energy.

The interior flow cavity of the slurry distributor can be configured such that each of the two flows of slurry move through the slurry distributor in a streamline flow. The interior flow cavity of the slurry distributor can be configured such that each of the two flows of slurry move through the slurry distributor with minimal or substantially no air-liquid slurry phase separation. The interior flow cavity of the slurry distributor can be configured such that each of the two

flows of slurry move through the slurry distributor substantially without undergoing a vortex flow path.

A gypsum slurry mixing and dispensing assembly constructed in accordance with principles of the present disclosure can include flow geometry upstream of the distribution outlet of the slurry distributor to reduce the slurry velocity in one or multiple steps. For example, a flow splitter can be provided between the mixer and the slurry distributor to reduce the slurry velocity entering the slurry distributor. As another example, the flow geometry in the gypsum slurry mixing and dispensing assembly can include areas of expansion upstream and within the slurry distributor to slow down the slurry so it is manageable when it is discharged from the distribution outlet of the slurry distributor.

The geometry of the distribution outlet can also help control the discharge velocity and momentum of the slurry as it is being discharged from the slurry distributor upon the moving web of cover sheet material. The flow geometry of the slurry distributor can be adapted such that the slurry discharging from the distribution outlet is maintained in substantially a two-dimensional flow pattern with a relatively small height in comparison to the wider outlet in the cross-machine direction to help improve stability and uniformity.

The relatively wide discharge outlet yields a momentum per unit width of the slurry being discharged from the distribution outlet that is lower than the momentum per unit width of a slurry discharged from a conventional boot under similar operating conditions. The reduced momentum per unit width can help prevent washout of a skim coat of a dense layer applied to the web of cover sheet material upstream from the location where the slurry is discharged from the slurry distributor upon the web.

In the situation where a conventional boot outlet is 6 inches wide and 2 inches thick is used, the average velocity of the outlet for a high volume product is 761 ft/min. In embodiments where the slurry distributor constructed in accordance with principles of the present disclosure includes a distribution outlet having an opening that is 24 inches wide and 0.75 inches thick, the average velocity is 550 ft/min. The mass flow rate is the same for both devices at 3,437 lb/min. The momentum of the slurry (mass flow rate\*average velocity) for both cases would be ~2,618,000 and 1,891,000 lb-ft/min<sup>2</sup> for the conventional boot and the slurry distributor, respectively. Dividing the respective calculated momentum by the widths of the conventional boot outlet and the slurry distributor outlet, the momentum per unit width of the slurry discharging from the convention boot is 402,736 (lb-ft/min<sup>2</sup>)/(inch across boot width), and the momentum per unit width of the slurry discharging from the slurry distributor constructed in accordance with principles of the present disclosure is 78,776 (lb-ft/min<sup>2</sup>)/(inch across slurry distributor width). In this case, the slurry discharging from the slurry distributor has about 20% of the momentum per unit width compared to the conventional boot.

A slurry distributor constructed in accordance with principles of the present disclosure can achieve a desired spreading pattern while using an aqueous calcined gypsum slurry over a broad range of water-stucco ratios, including a relatively low WSR or a more conventional WSR, such as, a water-to-calcined gypsum ratio from about 0.4 to about 1.2, for example, below 0.75 in some embodiments, and between about 0.4 and about 0.8 in other embodiments. Embodiments of a slurry distributor constructed in accordance with principles of the present disclosure can include internal flow geometry adapted to generate controlled shear effects upon the first and second flows of aqueous calcined